IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	Joseph F. Skovira	Confirmation No.:	7585
Serial No.:	10/634,693	Group Art Unit:	2195
Filed:	August 5, 2003	Examiner:	Zhe, Meng Yao.

Title: BALANCING WORKLOAD OF A GRID COMPUTING ENVIRONMENT

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Rosalind Q. Spiller

Rosalind Q. Spiller

Date of Signature: January 21, 2009.

To: Mail Stop Appeal Briefs – Patents
Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Dear Sir:

APPELLANT'S APPEAL BRIEF TO THE BOARD OF

PATENT APPEALS AND INTERFERENCES

This is an appeal from a final rejection, dated July 18, 2008, rejecting claims 1-3, 6 and 7, all the pending claims in the above-identified application. A Notice of Appeal and payment therefor, was timely electronically filed on November 18, 2008. An Appeal Brief is due on January 21, 2009, as January 18 was a Sunday, and the U.S. Patent and Trademark Office was closed January 19, 2009 for the Martin Luther King, Jr. holiday, and on January

20, 2009 for the presidential inauguration. This Brief is accompanied by a transmittal letter authorizing the charging of Appellant's Deposit Account for payment of the requisite fee set forth in 37 C.F.R. §41.20(b)(2). It should be noted that this Appeal Brief is being filed under the rules in effect prior to December 10, 2008, the new rules having been delayed as of this filing.

REAL PARTY IN INTEREST

This application is assigned to International Business Machines Corporation by virtue of an assignment executed by the inventor on July 30, 2003, and recorded with the United States Patent and Trademark Office at reel 014379, frame 0798, on August 5, 2003. Therefore, the real party in interest is International Business Machines Corporation.

RELATED APPEALS AND INTERFERENCES

To the knowledge of Appellant, Appellant's undersigned legal representative, or the assignee, there are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

This patent application was filed on August 5, 2003, with the U.S. Patent and Trademark Office. As filed, the application included twenty (20) claims, of which three (3) were independent claims (i.e., claims 1, 8 and 15).

On March 15, 2007, a first Office Action was mailed that included a rejection of claims 1-20. In particular, claims 1, 8 and 15 were rejected under 35 U.S.C. §102(b), as being anticipated by Xu (U.S. Patent No. 6,418,462); claims 1-6, 8-13 and 15-19 were rejected under 35 U.S.C. §102(e), as being anticipated by Guo et al. (U.S. Patent Application Publication No. 2005/0071843); and claims 7, 14 and 20 were rejected under 35 U.S.C. §103(a) as being obvious over Guo et al. in view of Suzuki et al. (U.S. Patent No. 4,394,730).

In response to this Office Action, Appellant filed an Amendment and Response to Office Action on June 15, 2007, in which claims 1-3, 6-10, 13-16 and 19-20 were amended, and claims 4, 5, 11, 12, 17 and 18 were canceled without prejudice. No claims were added. Claims 1-3, 6-10, 13-16 and 19-20 remained pending.

On August 23, 2007, a final Office Action was mailed that included a rejection of claims 1-3, 6-10, 13-16 and 19-20. In particular, claims 1-3, 6-10, 13-16 and 19-20 were rejected under 35 U.S.C. §103(a) as being obvious over DeBettencourt et al. (U.S. Patent No. 6,279,001) in view of Liu et al. (U.S. Patent No. 5,031,089).

In response to this final Office Action, Appellant filed an Amendment and Response to Final Office Action Accompanying Request for Continued Examination on October 23, 2007, in which claims 1-2, 8-9 and 13-16 were amended. No claims were added or canceled. Claims 1-3, 6-10, 13-16 and 19-20 remained pending.

On January 25, 2008, a non-final Office Action was mailed that included a rejection of claims 1-3, 6-10, 13-16 and 19-20. In particular, claims 1-3, 6-10, 13-16 and 19-20 were

rejected under 35 U.S.C. §103(a) as being obvious over DeBettencourt et al. (U.S. Patent No. 6,279,001) in view of Liu et al. (U.S. Patent No. 5,031,089).

In response to this Office Action, Appellant filed an Amendment and Response to Office Action on April 21, 2008, in which claim 1 was amended, and claims 8-10, 13-16 and 19-20 were canceled without prejudice. No claims were added. Claims 1-3 and 6-7 remained pending.

On July 18, 2008, a final Office Action was mailed that included a rejection of claims 1-3 and 6-7. In particular, claims 1-3, 6 and 7 were rejected under 35 U.S.C. §103(a) as being obvious over DeBettencourt et al. (U.S. Patent No. 6,279,001) in view of Wood et al. (U.S. Patent No. 7,082,606).

In response to this final Office Action, Appellant filed a Response to Final Office Action on September 16, 2008. No claims were amended, added or canceled. Claims 1-3 and 6-7 remained pending.

In reply to Appellant's response after final rejection, an Advisory Action was mailed on November 4, 2008. In response thereto, Appellant filed a combined Notice of Appeal and Petition for Extension of Time on November 18, 2008.

Therefore, the status of the claims is as follows:

Claims allowed – None.
Claims objected to – None.

Claims rejected – 1-3 and 6-7; and

Claims canceled – 4-5 and 8-20.

Appellant is appealing the rejection of claims 1-3 and 6-7, with each of the following claims being separately argued: 1-3 and 7.

STATUS OF AMENDMENTS

A Response to Final Office Action was filed on September 16, 2008. No claims were amended, added or canceled. Claims 1-3 and 6-7 remained pending. The Advisory Action dated November 4, 2008 indicated that for purposes of appeal the amendments to claims would be entered and provided an explanation of how the amended claims were rejected.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 recites a method for balancing the workload of a grid computing environment (100, FIG. 1; described at paragraphs 0014-0019), grid computing enabling virtualization of distributed computing and data resources to create a single system image from a plurality of systems (paragraph 0013). The method comprises obtaining scheduler information, by a manager daemon within one system of a plurality of systems in a grid computing environment (200, FIG. 2; described at paragraph 0020; see also paragraph 0018), from a scheduler of another system of the grid computing environment, the scheduler information including current free nodes of the another system, job queue of waiting jobs for the another system, shadow time for the next waiting job of the another system indicating how long the job needs to wait for resources, and one or more resources currently unavailable due to shadow time

(see paragraph 0020). The plurality of systems are at least one of heterogeneous and geographically distant from each other (see paragraph 0013). The method further comprises performing by the manager daemon workload balancing among at least two systems of the plurality of systems in the grid computing environment (202, FIG. 2; numbered paragraphs 0018 and 0028), each system of the at least two systems comprising a scheduler to schedule workload on its system (see paragraph 0015). The workload balancing uses at least a portion of the obtained scheduler information (see paragraph 0018), and comprises backfill scheduling a job, backfill scheduling allowing the job to run out of order as long as it does not affect the start time of another job scheduled to execute (see paragraph 0016).

Claim 2 depends from claim 1, and recites that the scheduler on each system is adapted to perform backfill scheduling (see paragraph 0016).

Claim 3 depends from claim 1, and recites that the scheduler information is obtained from at least two schedulers (200, FIG. 2; paragraph 0020), one scheduler of the at least two schedulers being a different scheduler from at least one other scheduler of the at least two schedulers (paragraph 0015).

Claim 7 depends from claim 1, and recites that the workload balancing includes (see paragraph 0023) removing a job from one system of the at least two systems, and assigning the job to another system of the at least two systems.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. The final Office Action rejected claims 1-3, 6 and 7, under 35 U.S.C. §103, as allegedly obvious over DeBettencourt et al. (U.S. Patent No. 6,279,001; hereinafter "DeBettencourt") in view of Wood et al. (U.S. Patent No. 7,082,606; hereinafter "Wood").

ARGUMENT

I. Rejection under 35 U.S.C. §103 over DeBettencourt in view of Wood.

Claims 1-3 and 7:

Claims 1-3, 6 and 7 stand rejected under 35 U.S.C. §103 as allegedly obvious over DeBettencourt in view of Wood. Appellant respectfully submits that the rejection of these claims is erroneous and respectfully request reversal of this rejection for at least the reasons set forth below.

As an initial matter, Appellant continues to submit that DeBettencourt does not involve a grid computing system as would be understood by one skilled in the art. Instead, DeBettencourt involves a typical serial web server arrangement. However, there are additional aspects as remarked below that are not taught or suggested as well.

Against, for example, the scheduler of claim 1, the final Office Action cites to the agent 106 of DeBettencourt (at column 10, lines 30-36). However, the alleged scheduler (agent 106) does not schedule anything, let alone workload. For example, the agent does not

schedule the serving of web pages by the associated web server. Instead, it is the manager 110 of all the web servers that controls which web server serves which page request and when, the agent merely communicating with the manager. See, for example, DeBettencourt at column 6, lines 29-30.

Instead of scheduling, DeBettencourt teaches that the agents 106 are invoked by watcher 109 (see DeBettencourt at column 9, lines 26-27) and simply monitor their host and notify the manager of events or other information, such as relaying information regarding web page requests, as well as act as a pass-through for commands to other components. See DeBettencourt at column 9, line 37 to column 10, line 36.

Thus, Appellant submits that the DeBettencourt agents are not schedulers.

As another example, against the wherein clause of the obtaining aspect of claim 1, the final Office Action cites to no section of DeBettencourt. In fact, web servers are typically clustered together, and there is no express teaching that the servers of DeBettencourt are either heterogeneous or geographically distant from each other.

As still another example, against the claimed shadow time, the final Office Action cites to DeBettencourt at column 13, line 16 (the agent 106 can determine server queue delay); column 11, Table 2 (list of performance stats available from UNIX and Windows NT operating systems); and Column 12, Table 3, item 20 (available information on each web page request includes time required to retrieve content).

As set forth in claim 1, shadow time indicates how long the next waiting job of another system needs to wait for resources. Shadow time does not refer to how long a job has to wait in the queue, but how long before resources needed to execute the job will become available. For example, if a given job is next up in a queue, and the necessary resources are not available to run the job, then shadow time is present. Thus, server queue delay (the first DeBettencourt cite) is not shadow time. Table 2 also does not list shadow time among the basic available performance stats. Finally, item 20 in Table 3 refers to processing time for a web page request, not time to wait for needed job resources.

Moreover, claim 1 recites shadow time for the next waiting job of another system. Since DeBettencourt does not teach shadow time, it also cannot logically teach or suggest shadow time for anything in particular, let alone the next waiting job of another system.

As yet another example, against the performing aspect of claim 1 (ignoring backfill scheduling for the moment), the final Office Action cites to DeBettencourt at column 13, lines 20-25. However, the performing aspect of claim 1 makes clear that each system has a scheduler to schedule workload on its system. Also made clear in DeBettencourt is that Manager 110 manages the web servers, not the agents. Appellant submits there is no scheduler in each system of DeBettencourt. See, for example, DeBettencourt at column 9, line 45 to column 10, line 16. The agents send information and statistics about the web page requests to the manager, but do not schedule anything. As noted above, only the manager schedules the jobs.

Appellant submits the addition of Wood to DeBettencourt does not remedy the multiple shortcomings of DeBettencourt mentioned above. Moreover, Appellant submits that Wood fails to teach or suggest the particular workload balancing claimed; that is, workload balancing among heterogeneous and/or geographically distant systems and moving a job from one system to another. Instead, Wood addresses how to backfill schedule a job within a sub-pool of homogeneous systems.

Therefore, for at least the reasons noted above, Appellant submits that claim 1 cannot be rendered obvious over DeBettencourt in view of Wood.

Appellant submits that the dependent claims are allowable for the same reasons as the independent claims from which they directly or ultimately depend, as well as for their additional limitations.

For example, with regard to claim 2, the final Office Action alleges that DeBettencourt teaches the scheduler on each system being adapted to perform backfill scheduling. However, this is in stark conflict with the admission on page 3 that DeBettencourt does not teach backfill scheduling. Moreover, as noted above, the agents in DeBettencourt are not schedulers.

Appellant submits Wood does not remedy the noted shortcomings of DeBettencourt with regard to claim 2. Since the agents of DeBettencourt do not schedule anything, one skilled in the art would not be motivated to add backfill scheduling thereto. Doing so to the

DeBettencourt manager also fails to read on claim 2, since this is done on each system, and there is only one manager in DeBettencourt.

Therefore, for at least the reasons noted above, Appellant submits that claim 2 cannot be rendered obvious over DeBettencourt in view of Wood.

As another example, claim 3 recites that the scheduler information is obtained from at least two schedulers. In addition, one of the schedulers is different from at least one other of the schedulers.

Against claim 3, the final Office Action cites to DeBettencourt at FIG. 1, alleging that each host has its own queue and scheduler maintained by the agent, which allegedly differs from agents of another host.

DeBettencourt teaches that the agents 106 are invoked by watcher 109 (see DeBettencourt at column 9, lines 26-27) and simply monitor their host and notify the manager of events or other information, such as relaying information regarding web page requests, as well as act as a pass-through for commands to other components. See DeBettencourt at column 9, line 37 to column 10, line 36.

However, Appellant could find no teaching or suggestion in DeBettencourt of the agents scheduling anything or otherwise acting as a scheduler. In addition, Appellant could find no teaching or suggestion regarding the agents being different from one another in any respect.

Appellant further submits that Wood and the cited combination fail to remedy the shortcomings noted above with respect to DeBettencourt.

Therefore, for at least the reasons noted above, Appellant submits that claim 3 cannot be rendered obvious over DeBettencourt in view of Wood.

As still another example, claim 7 recites that the workload balancing of claim 1 includes removing a job from one of the systems, and assigning the job to another of the systems.

Against claim 7, the final Office Action cites to the abstract of Wood.

However, a careful reading of the Wood abstract reveals nothing about movement of jobs from one system to another. Indeed, a review of the Summary of Wood makes clear the focus is on scheduling prior to assignment. Appellant could find nothing in Wood regarding actually moving a job between systems. As an aside, Appellant also notes that Wood uses homogeneous sub-pools of nodes. Recall that claim 1, from which claim 7 depends, recites that the systems are heterogeneous and/or geographically distant from one another.

Appellant submits the noted shortcomings of Wood with respect to claim 7 are not remedied by DeBettencourt or the cited combination.

Therefore, for at least the reasons noted above, Appellant submits that claim 7 cannot be rendered obvious over DeBettencourt in view of Wood.

CONCLUSION

In conclusion, Appellant submits that none of claims 1-3, 6 and 7 is rendered obvious over DeBettencourt in view of Wood. Therefore, Appellant submits that the final Office Action should be reversed in all respects.

Respectfully submitted,

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Dated: January 21, 2009.

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CLAIMS APPENDIX

1. (Previously Presented) A method of balancing workload of a grid computing environment, grid computing enabling virtualization of distributed computing and data resources to create a single system image from a plurality of systems, said method comprising:

obtaining scheduler information, by a manager daemon within one system of a plurality of systems in a grid computing environment, from a scheduler of another system of the grid computing environment, said scheduler information including current free nodes of the another system, job queue of waiting jobs for the another system, shadow time for the next waiting job of the another system indicating how long the job needs to wait for resources, and one or more resources currently unavailable due to shadow time, wherein the plurality of systems are at least one of heterogeneous and geographically distant from each other; and

performing by the manager daemon workload balancing among at least two systems of the plurality of systems in the grid computing environment, each system of the at least two systems comprising a scheduler to schedule workload on its system, said workload balancing using at least a portion of the obtained scheduler information, and wherein the workload balancing comprises backfill scheduling a job, said backfill scheduling allowing the job to run out of order as long as it does not affect the start time of another job scheduled to execute.

2. (Previously Presented) The method of claim 1, wherein the scheduler on each system is adapted to perform backfill scheduling.

3. (Previously Presented) The method of claim 1, wherein scheduler information is obtained from at least two schedulers, and wherein one scheduler of the at least two schedulers is a different scheduler from at least one other scheduler of the at least two schedulers.

4-5. (Canceled)

6. (Previously Presented) The method of claim 1, wherein the workload balancing includes:

determining which system of said at least two systems a job is to be assigned; and

assigning the job to the determined system.

7. (Previously Presented) The method of claim 1, wherein the workload balancing includes:

removing a job from one system of the at least two systems; and

assigning the job to another system of the at least two systems.

8-20. (Canceled)

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE